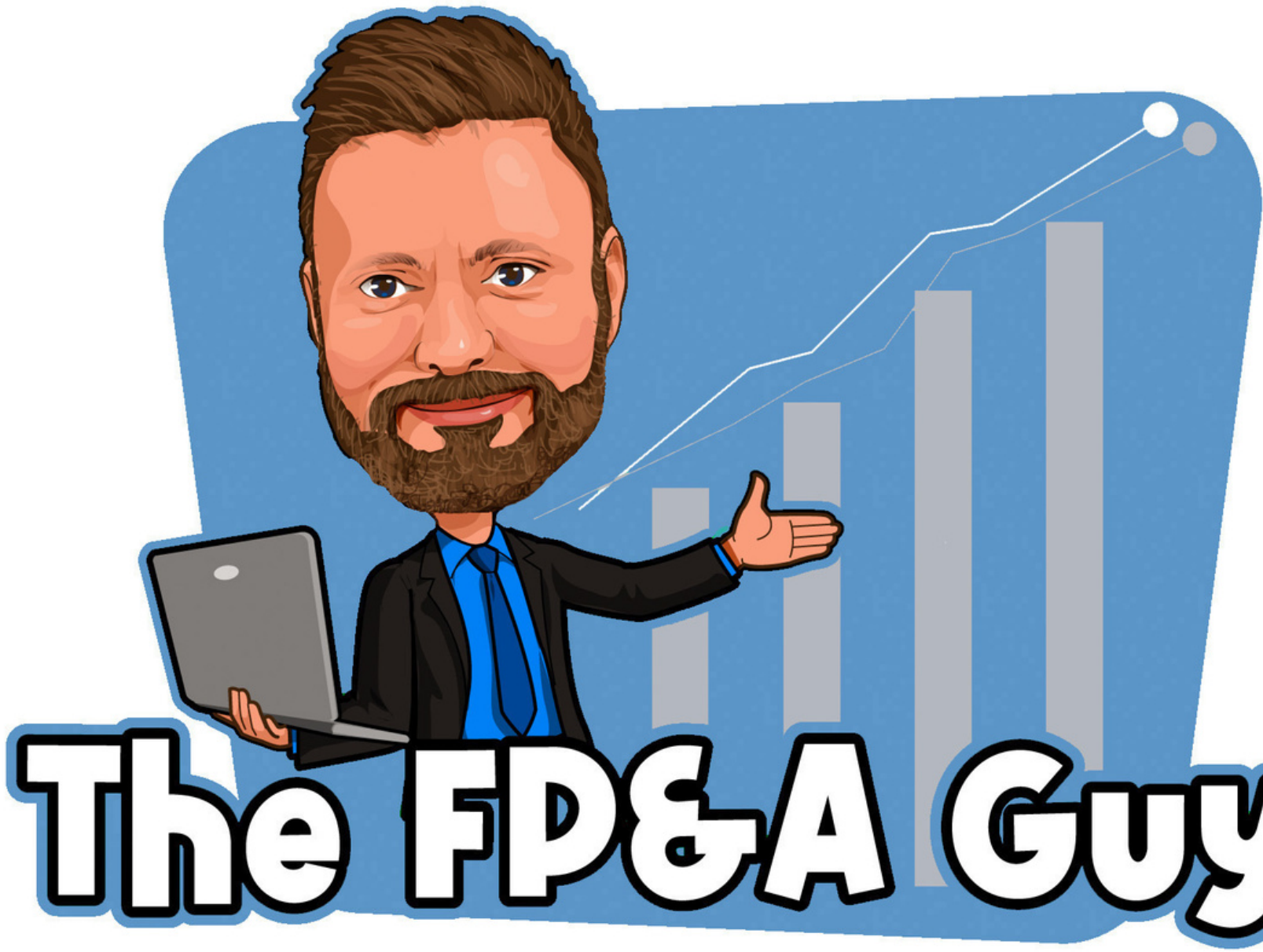
Excel - Dynamic Arrays



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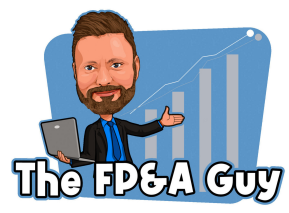
Dynamic Arrays

Dynamic Arrays are the biggest change to Excel formulas in years. Maybe the biggest change ever. This is because Dynamic Arrays let you easily work with multiple values at the same time in a formula.

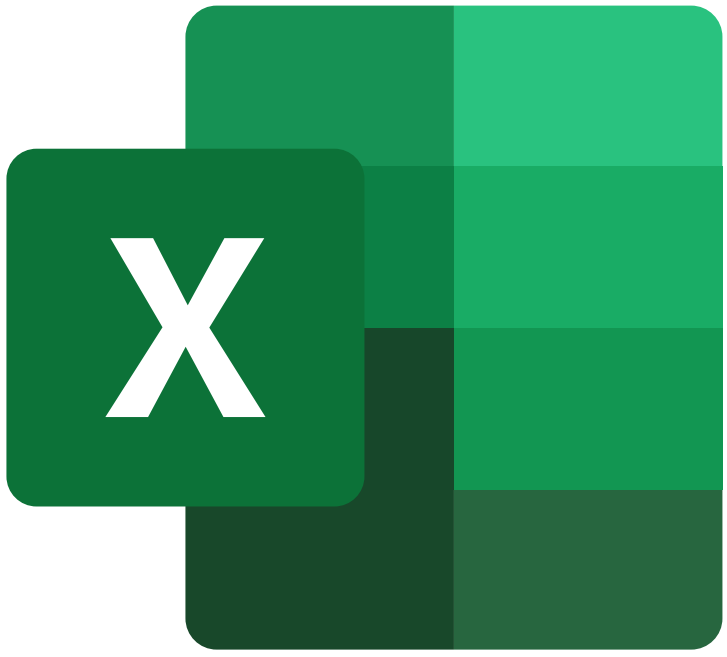
- EXCELJET

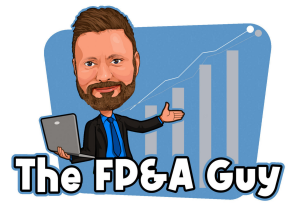
https://exceljet.net/articles/dynamic-array-formulas-in-excel



Dynamic Arrays

Microsoft overhauled the calculation engine and released Dynamic Arrays in 2000. Prior to this time the default behavior in Excel was to return a value to one cell only.If you want to return multiple values into multiple cells you had to use Control Shift Enter to create an array formula.Today in Microsoft 365 the default is for formulas to spill into multiple cells and for them to dynamically resize when the answer changes.





Dynamic Arrays Behavior

1. Spill numbers dynamically with one formula

1	=SEQUENCE(5,,1,1)
2	#N/A
3	#N/A
4	#N/A
5	#N/A

The above example is a dynamic formula. What is happening is that one formula is spilling into 5 cells. The one formula is displaying the numbers 1 through 5 and this is the default behavior in Excel 365. You can see when we use the Textformula it only shows a formula in the first cell and #N/A in the spilled cells.

In Excel before 365 the default behavior was for the formula to return an answer into only one cell.

Dynamic Arrays Behavior

Here are a few things to keep in mind about dynamic arrays:

1. The formula is housed in the first cell, and every other cell that an answer spills into is grayed out to indicate it is a spilled formula.

2. If you want to reference an array formula range you type the cell the formula is in and then the # symbol so if the formula was in K7 you would type k7# and it would reference the whole range.

3. If the formula cannot spill because a cell already contains a value, the #SPILL! error will appear. See cell K2 for an example.

4. Dynamic Arrays do not work inside Excel Tables. However dynamic arrays can reference tables and will workoutide of the table structure

Dynamic Arrays Functions

- **CHOOSEROWS** - Returns the rows that you specify from an array/range of data.

  Syntax: =CHOOSEROWS(array, row_num1,[row_num2],...)

  - **Array/Range** - Contains the rows to be returned and is a required input
  - **Row_num1** - Enter the first-row number to be returned, the required input
  - **[Row_num2]...** - Enter additional row numbers, 1st row required others optional

- **CHOOSECOLS** - Returns the columns that you specify from an array/range of data.

  Syntax: =CHOOSECOLS(array, col_num1,[col_num2],...)

  - **Array/Range** - Contains the columns to be returned and is a required input
  - **Col_num1** - Enter the first-column number to be returned, required input
  - **[Col_num2]...**- Enter additional column numbers; first required others are optional

- **DROP** - Excludes a specified number of rows or columns from the start or end of an array. Example dropping your headers.

  Syntax: =DROP(array, rows,[Columns])

  - **Array/Range** - Range from which you will drop rows or columns
  - **Rows** - # of rows to drop, negative drops from the end of the range
  - [**Columns]** - # of columns to drop, negative drops from the end of the range

Dynamic Arrays Functions

- **EXPAND** - Expands/pads an array/range with a specified number of rows and columns

  Syntax: =EXPAND(array, rows, [columns],[pad_with)

  - **Array/Range** - This is the array/range you want to expand, the required input
  - **Rows** - The # of rows to include in the expanded array and is required
  - **[Columns]** - The # of columns to include in the expanded array is optional
  - **[Pad-With] -** The value you want to pad the range with, and the default is #N/A

- **FILTER** - Filters an array/range of data based on your criteria

  Syntax: =FILTER(array,include,[if_empty

  - **Array/Range** - The array or range to filter
  - **Include** - Enter the inclusion criteria as a boolean array/range whose is the same size as the filter array.
  - **[If-empty]** - The value to return if the filter array returns no values

- **HSTACK** - Combine ranges/arrays together to create a larger array/range

  Syntax: =HSTACK(array1,[array2]...)

  - **Array1** - Enter the first array/range you want to combine together
  - **[Array2]...** - Enter additional arrays/ranges you want to combine

Microsoft Excel 365 Functions

- **SEQUENCE** - Used to generate a list of sequential numbers in a range/array.

  Syntax: =SEQUENCE(rows,[columns],[start],[step]

  - **Rows** - Enter the number of rows you want to return, is a required field
  - **[Columns] -** Enter the number of columns you want to return, optional field
  - **[Start]** - Enter the number you want to start with if not entered, starts with 1
  - **[Step]** - Enter the amount to increment each number by if not entered assumes 1

- **SINGLE -** This function is used to return a single value with implicit intersection.

  Syntax: =Single(value)

  - **Value** - Enter the value you want to be evaluated using implicit intersection

- **SORT** - Used to sort a range or array.

  Syntax: =DROP(array,[sort_index],[sort_order],[by_col])

  - **Array/Range** - The range/array to be sorted, required argument
  - **[Sort_index]** - The number that identifies the column or row to sort by, optional
  - **[Sort_order]** - Enter 1 for ascending or -1 for descending order, ascending is default
  - **[by_col] -** Used to indicate desired sort function, by row or column

Microsoft Excel 365 Functions

- **SORTBY** - Sorts a range or array using another range or array.

  Syntax: =SORTBY(array,by_array1,[sort_order1],[by_array2], [sort_order 2],...

  - **Array/Range** - The range/array that is being sorted
  - **By_array1** - The first range/array to be sorted on
  - **[Sort_order1]** - Sort order for criteria 1, 1 for ascending, -1 for descending
  - **[By_array2] -**The second range/array to be sorted on
  - **[Sort_order2]** - Sort order for criteria 2, 1 for ascending, -1 for descending
  - **...** You can have multiple arrays and sort orders such as 3,4,5,6, etc.

- **TAKE -** Returns contiguous rows or columns from the beginning or end of an array/range based on what you specify.

  Syntax: =TAKE(array,rows,[columns)

  - **Array/Range** - The array/range from which to take the rows or columns
  - **Rows** - Enter the number of rows to take, if from end-use negative values
  - **Columns** - Enter the number of columns to take, if from end-use negative values

Microsoft Excel 365 Functions

- **TEXTBEFORE -** Allows you to return text before a given character or string.

  Syntax: =TEXTBEFORE(text, delimiter,[Instance_num], [match_mode],[match_end],[if_not_found]

  - **Text** - This is the text that you want to search and is required
  - **Delimiter** - This is where you mark the point before which you want to extract the data and is required.
  - [**Instance_num]** - The instance for which you want to extract the text by default will extract at the first instance, a negative number starts the search from the end
  - **[Match_mode]** - Enter 0 for case sensitive, 1 for case insensitive, optional
  - **[Match_end]** - Will treat the end of the text as a delimiter, by default is an exact match
  - **[If_not_found]** - Enter the value you want to return if nothing is found, optional

- **TEXTAFTER -** Allows you to return text after a given character or string.

Syntax: =TEXTAFTER(text, delimiter,[Instance_num], [match_mode],[match_end],[if_not_found]

- See TEXTBEFORE formula for details around each function input as it operates the same it is just used to split text after a certain point instead of before a certain point.

Microsoft Excel 365 Functions

- **TEXTSPLIT -** Allows you to split text strings by using column and row delimiters

  Syntax: =(text, col_delimiter,[row_delimiter],[ignore_empty], [match_mode],[pad_with])

  - **Text** - Enter the text you want to split, required field
  - **Col_Delimiter** - This delimiter is used to spill the text across the columns and is required
  - **[Row_Delimiter]** - Delimiter is optional and used to spill the text down the rows
  - **[Ignore_empty]** - Tell the formula what to do when you have two delimiters next to each other and so one is empty and contains no data. Use True/False, optional
  - **[Match_Mode]** - Search the text in case sensitive or case insensitive mode, optional argument
  - **[Pad_with]** - This is the value for which to pad the result. By default it is #N/A

- **TOCOL -** Returns an array/range in a single column.

- **Syntax: =** TOCOL(array,[ignore],[scan_by_column])

  - **Array/Range -** Array/range that is to be returned as a column
  - **[Ignore]-** Ignore certain values, 0 - keeps all, 1 - ignore blanks, 2 - ignore errors, 3 - ignore errors and blanks
  - **[Scan_by_column] -** by default, the array is ordered by row, and you will need to tell it you want it to order the values by column. True- Columns, False - row

Microsoft Excel 365 Functions

- **TOROW** - Returns an array/range in a single row

  Syntax: = Syntax: = TOROW(array,[ignore],[scan_by_column])

  - **Array/Range -** Array/range that is to be returned as a row
  - **[Ignore]**- Ignore certain values, 0 - keeps all, 1 - ignore blanks, 2 - ignore errors, 3 - ignore errors and blanks
  - **[Scan_by_column] -** by default the array is ordered by row, and you will need to tell it you want it to order the values by column. True- Columns, False - rowl

- **UNIQUE -** Returns a list of unique values from a range/array

  Syntax: =UNIQUE(array,[by_col],[exactly_once]

  - **Array/Range** - The array/range from which you want to return unique list
  - **[by_col]** - This argument is optional and is used to determine how to compare data
  - **[Exactly_once]** - Optional argument that returns list of data that appears only once

- **VSTACK** - Combine/append multiple ranges/arrays into one large vertical array

  Syntax: =DROP(array1, [array2]..)

  - **Array1** - This is the first array you want to append to the list
  - [Array2]... This is the additional arrays you want to append to the list

Microsoft Excel 365 Functions

- **WRAPCOLS** - Wraps the provided range/array by columns at a specified point to create a new array

  Syntax: =WRAPROWS(Vector, Wrap_count,[pad_with])

  - **Vector -** The reference of cells to wrap
  - **Wrap_Count -** The number of values to include in each column
  - **[Pad_with]** - The value to pad with when no value is included

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  - **[Pad_with]** - The value to pad with when no value is included

- **RANDARRAY** - Returns a random array of numbers

  Syntax: =RANDARRAY([rows],[columns],[min],[max], [whole_number]

  - **[Rows]** - The number of rows you want to return
  - **[Columns]** - The number of columns you want to return
  - **[Min]** - The minimum number you want to include in your array
  - **[Max]** - The maximum number you want to include in your array
  - **[Whole_number] -** True - returns a whole number, false - decimal values

The FP&A Guy

Microsoft Excel 365 Functions

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  - **[Columns]** - The number of columns you want to return
  - **[Min]** - The minimum number you want to include in your array
  - **[Max]** - The maximum number you want to include in your array
  - **[Whole_number] -** True - returns a whole number, false - decimal values

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Microsoft Excel 365 Functions

- **XMATCH** - searches for an item in a range/array, returns position

  Syntax: =XMATCH(lookup_value,lookup_array,[Match_mode], [Search_mode])

  - **Lookup_value** - The value you want to lookup in your array
  - **Lookup_array** - The range/array to search in for the lookup value
  - **[Match_mode]** - Match type, 0 - exact, -1 exact or next smallest, 1- exact or next largest, 2 - wildcard match
  - **[Search_mode] -** 1 - search first to last, 2 - search last to first, 2 and -2 binary

- **XLOOKUP** - Used to find something in a range/array

  Syntax: =XMATCH(lookup_value,lookup_array,return_array, [if_not_found],[Match_mode],[Search_mode])

  - **Lookup_value** - The value you want to lookup in your array
  - **Lookup_array** - The range/array to search in for the lookup value
  - **Return_array** - The range/array to return the value from
  - **[If_not_found] -** Enter text you want displayed when no value is found
  - **[Match_mode]** - Match type, 0 - exact, -1 exact or next smallest, 1- exact or next largest, 2 - wildcard match
  - **[Search_mode]** - 1 - search first to last, 2 - search last to first, 2 and -2 binary

Dynamic Arrays Resources

- Game Changer: Excel Dynamic Arrays Blog https://www.thefpandaguy.com/microsoft-excel/game-changer-excel-dynamic-arrays-78dtr

- Dynamic array formulas in Excel https://exceljet.net/articles/dynamic-array-formulas-in-excel

- Dynamic array formulas and spilled array behavior https://support.microsoft.com/en-us/office/dynamic-array-formulas-and-spilled-array-behavior-205c6b06-03ba-4151-89a1-87a7eb36e531

- Excel Dynamic Array Functions - What are they, how to use them, Examples and FAQs https://chandoo.org/wp/dynamic-array-functions/